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Working across scales in integrated catchment management: lessons learned for adaptive water governance from regional experiences

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Abstract

Integrated Catchment Management (ICM) has in recent years been promoted by a wealth of "top-down", government policies, while a number of "bottom-up", community-based initiatives have also been set up. At the same time, adaptive water governance, built around multi-level, integrative and participatory institutional arrangements, is called for in order to enhance adaptive capacity of social-ecological systems to global changes. Working across scales, aligning planning processes, and multi-actor collaboration are key issues in the linking of top-down and bottom-up ICM, hence providing insights into how adaptive water governance can work in practice. The paper presents a study of how ICM actors work across scales and reconcile national and local priorities in 15 regional experiences chosen to reflect a diversity of scales, histories and governance arrangements. It is complemented with an in-depth, illustrative example, taken from the Tweed River Basin in Scotland, where a local charity has gradually developed and helped bridge gaps between local communities and government. Research results present the ways in which "*trusted intermediaries*" can successfully close the gap across levels of governance, i.e. between communities, business, and governmental interests at multiple scales. Local "*trusted intermediaries"* perform well, with their local knowledge, at building rapport with key actors and effectuate change on the ground. The research also indicates the need for a legal framework, or at least an established policy structure, that acts to harness the good will and interests of local actors while improving implementation of broader, national objectives. There appears to be no specific mechanism for multi-level collaboration, although results indicate that more formal and coercive forms of partnership are necessary at later stages to ensure implementation, for example via the establishment of formal duties on public bodies or legally binding agreements between ICM stakeholders.

Keywords: Multi-level governance; Water user associations; Climate change; Civil society; Public policy

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1. Introduction

Many of the most pressing challenges facing the management of water resources such as changes in land use and climate have been characterised as 'wicked problems' as they extend beyond traditional scales of analysis and management, and pose new uncertainties for decision-making (Pahl-Wostl 2007a; Cosens et al 2014). Critics have thus argued for moving beyond fragmented and single-issue driven responses towards holistic approaches across sectors and actors at multiple levels (Biswas 2004; Molle 2006), combined with improved communication and extended engagement between governments and stakeholders to better link strategic decision-making and operational practice (Falkenmark et al. 2004).

In an era of rapid global and climate changes, scholars have argued for establishing more "adaptive" forms of natural resource management to build resilience in social-ecological systems (Holling 1978). In adaptive water management, uncertainties, lack of knowledge and inertia due to multi-stakeholder opposition are overcome through a program of continual information gathering, learning and adjustment of operational approaches and models (Medema et al. 2008). More ambitious scholars have called for adaptive water governance (Pahl-Wostl 2007b; Huitema et al. 2009), where adaptive governance refers to increasing the capacity of whole social-ecological systems to turn changing conditions and perturbations into an opportunity to re-organise internally and shape the direction of change into a new system state that is environmentally, socially and economically desirable (Folke et al. 2005). Thus, not only management processes and structures are relevant for building resilience, but also underpinning decision-making processes and structures that link geographical scales, administrative levels and sectoral activities.

The adaptive governance scholarship draws heavily on Ostrom's work on multi-level governance (Ostrom 1990) which provides extensive guidance on the design of institutions for effective community-level natural resource

management. Scholars on adaptive governance call for example for quasi-autonomous management units operating at multiple spatial scales so as not to hinder the self-organising capacities of communities and better respond to local impacts of environmental change and crisis (Folke et al. 2005; Nelson et al. 2007; Duit et al. 2010). Identifying design principles for the effective linking of management units with higher levels of governance has proved more challenging and current knowledge remains general. In water management, recent scholarship suggests that concentrating all powers in one organisation is not necessarily adequate; rather the focus should be on enabling collaboration (Huntjens et al. 2011; Hill and Engle 2015) and promoting (social) learning (Ison et al. 2007; Mostert and Pahl-Wostl 2010). Collaboration and learning are facilitated through participative processes and reinforced through informal networks where rules for the group are not formally prescribed and allowed to emerge, for example when participation is opened to newcomers, mandates are not set, and results are not binding (Pahl-Wostl 2009; Pahl-Wostl et al. 2012).

This paper contributes to the search for integrative, multi-level and participatory arrangements in adaptive water governance by examining recent attempts at establishing Integrated Catchment Management (ICM). Catchments are characterised by complexity, connectivity, temporal and spatial change and competing ecosystem services (Maltby et al. 2011), with different stakeholders bringing multiple perspectives to the table (Imperial 2005; Smith et al 2015). Hence, a catchment approach to water management must work across multiple layers of governance, each with its own set of rules, policies, and stakeholders. The governance of integrated catchment management appears to be currently dominated by two types of approaches: "top-down" and "bottom-up" processes.

The EU Water Framework Directive (WFD) perhaps best exemplifies what can be seen as a "top-down" approach to implementing catchment management. "Top-down" implies that objectives and instruments are mostly set by bureaucracies through formal legislative and regulatory processes, and are thus steered by higher, governmental organisational levels. Under the WFD, River Basin Management Plans (RBMPs) must be prepared by government and their agencies in order to reach "good ecological status". Although the involvement of stakeholders must be promoted, the planning process is geared to support the achievement of WFD objectives rather than to respond to broader societal demands (Blackstock 2007; Keesen et al. 2010; Hendry 2014). In parallel to the establishment of top-down ICM, there has been a growth of "bottom-up" initiatives worldwide, as seen in the USA (Leach and Pekley 2001; Lubell 2004; Sabatier et al 2005) and the UK (Cook et al. 2012;

Benson et al. 2013), but also Australia (Mitchell and Hollick 1993), Canada and New Zealand (Menon et al 2010; Cook et al. 2013). These informal, voluntary forms of catchment partnerships, though initially small scale and single issue focused, are now advanced approaches driven at multiple scales and tackling multiple issues, and appear at times to challenge top-down ICM (Cook et al. 2013).

The research presented in this paper seeks to move away from examining "top-down" and "bottom-up" processes separately or to position them as antagonistic processes, but instead aims to understand how the linking of national and local processes for ICM occurs, and how priorities are balanced within this complex institutional structure (Figure 1). The focus of this paper is not a detailed operation analysis of the integration of different management activities on the ground. Rather it examines the alignment and integration of governance processes, one positive outcome being, potentially, better integrated catchment management.

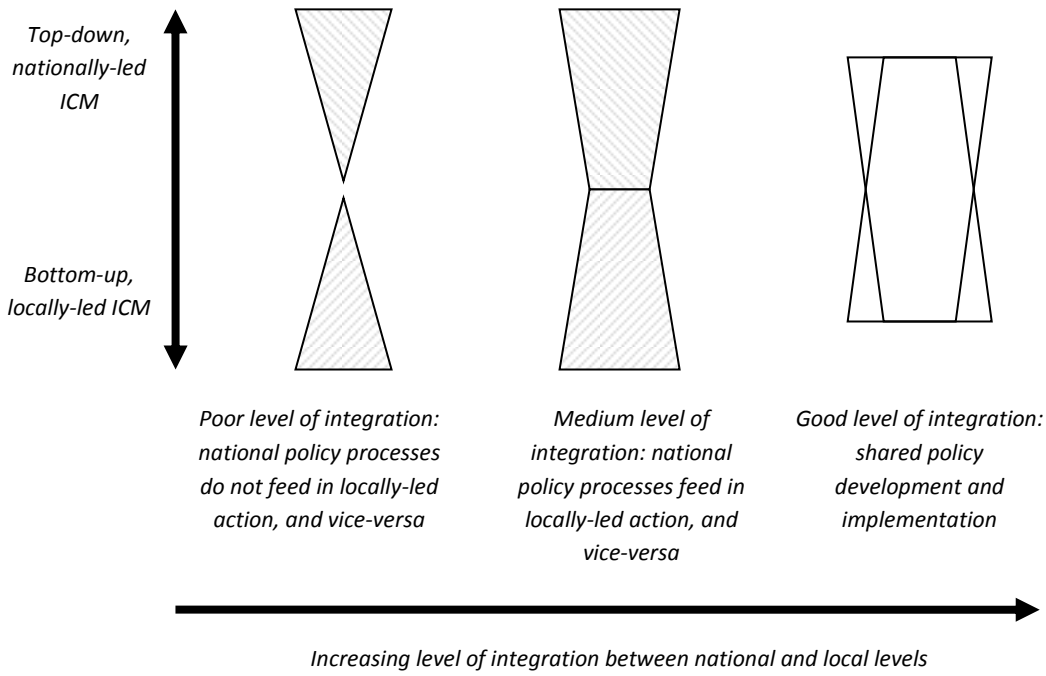

Figure 1. Integrating top-down and bottom-up ICM

Three questions structured the research: 1) how are ICM projects institutionally structured; 2) how do national and local organisations engage and collaborate with each other; and 3) how do national and local organisations achieve a balance between their respective priorities. The research draws on two complementary data sources. First, results from a survey of 15 ICM projects representing different approaches to linking top-down and bottom-up processes are presented in Section 3. Second, an illustrative example of linking top-down and

bottom-up processes, and the challenges in doing so, is presented in more depth in Section 4. Based on this sample, the paper concludes on the main lessons learned for ICM and adaptive water governance.

2. Data sources and analysis

The research was carried out in the context of a wider project on ICM for the Centre for Expertise for Waters (CREW 2015), a hub which aims to make water research and expertise available and accessible to the Scottish Government and its agencies in a timely and effective manner. The research is based on experiences from 15 ICM projects, identified through professional contacts in the UK and using the UNESCO Hydrology Environment Life Programme (HELP) basin network database (including 100+ river basins). The selection of projects was based on relevance (i.e. existence of top-down and bottom-up processes), history (i.e. emerging vs established ICMs), and diversity (i.e. scales, types of leadership). The selection focused on the UK (with twelve catchments), and included one catchment in each of the following countries: Australia (Victoria State), France, and the United States of America (Iowa).

A mix of documentary analysis and interviews was used to examine the ICM projects. Documents analysed include previous UNESCO reports, policy documents, technical reports, academic literature and web-sites. A total of 22 interviews were carried out with representatives of the lead organisations for each ICM project, as well as representatives of relevant governmental organisations. Interview schedules were prepared around the three main research questions. Interviews were performed through Skype and site visits and meetings. Interviews were recorded, transcribed, and coded in themes through NVIVO7. Codes were used to index information in interview transcripts into themes to help retrieve data as required to help the analysis. Themes were identified inductively based on the three research questions, and included: institutional structure (including the legal and organisational framework), collaborative mechanisms (including different types of partnerships) and balancing national and local priorities (including prioritisation approaches and funding arrangements). Themes were then examined to identify commonalities and differences between ICM projects. The next section presents the results of the international survey following the three above themes.

3. The challenge of working across scales: a survey of ICM experience

Table 1 presents some of the main characteristics of the ICM projects surveyed. Many of the ICM projects examined in the UK were led by NGOs, usually River Trusts. Most River Trusts have historically focused on fisheries issues, but are now taking a broader multiple issues approach at the catchment scale. Some have been from their inception fully dedicated to integrated water and land management (e.g. Tweed Forum). One project in the UK (Hampshire Avon) was led by a Wildlife Trust, an NGO traditionally focused on biodiversity protection and habitat restoration. In the Hampshire Avon, the ICM was closely co-managed by Natural England, which is the English statutory agency for the conservation of the natural environment. The Frome-Piddle ICM project was led by a private drinking and waste water utility (Wessex Water), while the Don ICM project was closely associated with academia. The Parrett ICM project was based on a partnership between multiple local stakeholders, although its management was supported by the local authority. The Australian and French ICM projects were led by statutory authorities established to implement river basin management, whilst the Iowa-Cedar ICM projects was led by a coalition of state and federal agencies to tackle flooding and diffuse pollution, but also closely linked with the leadership of academic partners.

Table 1. ICM project surveyed and organisations interviewed

Country of catchment	Catchment	Size (km^2)	Population density (per km^2)	Start of ICM*	Lead organisations interviewed
United-Kingdom	Aire	1,160	948	2011	Rivers Trust
	Ballinderry	450	73	1984	Rivers Trust
	Don[a]	1,720	1,163	2006	Rivers Trust
	Frome-Piddle[b]	900	900	2010	Water utility
	Hampshire Avon[b]	1,750	131	1999	Wildlife Trust, Natural England
	Kennett[a]	1,160	151	1990	Rivers Trust
	Parrett[b]	1,700	176	2000	Water management partnership
	Yorkshire Dales**[b]	4,860	123	2004	Rivers Trust
	Tamar[b]	1,800	189	1995	Rivers Trust
	Tyne[b]	2,900	276	1994	Rivers Trust
	Tweed[a]	5,000	17	1991	Rivers Trust
	Welland[ab]	1,680	149	2010	Rivers Trust
Australia	Goulburn Broken[a]	24,300	8	1997	Catchment Management Authority, Murray-Darling River Basin Authority
France	Adour-Garonne[a]	115,000	61	1964	Water Agency
US	Iowa-Cedar[a]	32,690	31	2009	Academia, Iowa-Cedar Inter-Agency Co-ordination Team, Cedar River Coalition

** It was difficult to locate the start of the ICM approach, therefore the date provided usually represents the date the organisation was set up or the start of the partnership. Where possible this represents the start of an ICM approach.*

*** Includes the Swale, Ure, Nidd & Wharfe*

[a] Part of the UNESCO IHP-HELP network

[b] Part of one of the UK government pilots on catchment management, namely Demonstration test catchments; Catchment sensitive farming, Defra pilot catchments, EA pilot catchments

3.1. What is the institutional structure of ICM projects?

None of the ICM projects appeared embedded in a strongly integrated policy framework for ICM: no "master plan" existed that aligned public interventions across a range of scales and policies relevant for ICM. However some broad distinctions can be made between Europe (UK and France), Australia and the USA.

In the European context, the "top-down" is represented by the WFD which has led to the preparation of RBMPs (15 in total in the UK), now in their second planning cycle (2009-2015; 2015-2021). While public participation is required, the objective of these plans is for individual water bodies to meet "good ecological status" which is essentially an environmental target. Defra and the EA, and devolved administrations in Scotland, Wales and Northern Ireland, are in charge of preparing RBMPs and meeting WFD objectives in the UK. The "bottom-up" is represented by a variety of local initiatives, led by NGOs, water utilities, or partnerships between local organisations (including for example local authorities). Through The Rivers Trust and the Rivers and Fisheries Trust of Scotland, and their 68 members, the NGO movement has become strongly established in promoting ICM.

From interviews, there appears to be currently a close relationship between public authorities implementing the WFD and local NGOs. NGOs stressed the importance of working with authorities to gain institutional support, facilitate access to funding, and increase local impact. Interviewees from Defra and the EA signalled their interest to draw on the range of activities carried out locally to support the implementation of RBMP and reaching WFD objectives. Using the language of one interviewee, the work of such NGOs can be distinguished between researching, campaigning and delivering. When researching, local NGOs monitor the water environment, compile examples of good practice, and disseminate information. When campaigning, local NGOs respond to public consultations, raise awareness, provide advice to local communities and land managers, promote volunteering activities, and identify local "champions" who will build support for change. As deliverers, local NGOs improve communication between public authorities and stakeholders, and improve the coherence of the activities in the catchment. They may also find synergies between funding streams or raise funds themselves to deliver projects.

In France, the relationship between the national and local levels is more formalised. Created in the 1970s, the (publicly managed) water agencies have progressively been implementing river basin management in the six river basins (metropolitan France), notably via the Schema d'Aménagement et de Gestion des Eaux (SDAGEs) required by the 1992 Water Law. SDAGEs are planning instruments which aim to foster concerted action between national, regional and local governments, and stakeholders. SDAGEs have been designated as the main river basin planning instrument for reaching WFD objectives. However, other regional objectives can be included in SDAGEs, keeping in that regard one of its original purposes. The French government has also created, in 1981 and 1992, two voluntary planning instruments for fostering concerted action at the level of smaller territories (e.g. catchments, rivers, lakes, estuaries, aquifer): respectively "contrat de milieu" (previously called "river contracts") and the Schema d'Aménagement et de Gestion des Eaux (SAGE). They are respectively overseen by a "*river council*" (mainly regional and local actors) or a *"local water commission"* (regional and local actors but also relevant national actors). SAGE have now become the main planning instrument for reaching WFD objectives at the sub-basin level, and, while they remain voluntary, water agencies are actively encouraging local actors to establish new ones. In the Adour-Garone basin, 24 SAGEs now exist although only 10 have so far been approved.

The Gouldburn-Broken ICM operates within a largely statutory-based nested governance arrangement. At higher levels, the Murray-Darling River Basin Authority, established in 1987, sets the objectives for the whole river basin. The Gouldburn-Broken Catchment Management Authority (CMA) is a public organisation set up in 1997 following the Catchment and Land Protection Act of 1994. It is one of the 56 CMAs in Australia, with a role in licensing water use, leading strategic management planning, and delivering floodplain management. While statutory-based, it is supervised by a board of appointed local community members, and its role should be understood in the long Australian tradition of promoting community-based water and land management. Strategic catchment planning however became established with the creation of the mid-Goulburn Catchment Co-ordinating Group in 1988; the adoption of (sub)catchment planning as a core principle for the Landcare programme in the 1990s; the growth of coordinating networks between Landcare groups; and the creation of the CMA in 1997 (Barwick 2008). It is evident from interviews that Landcare groups now represent a key level of action for ICM. More than 80 Landcare (and related) groups existed in the catchment in 1992, aiming to manage, amongst other issues, soil salinity and erosion (Barwick 2008). The Landcare Programme was initially launched in the 1980s by Victoria state government and the Australian government to strengthen community-

based land management. It is co-managed by CMAs. In parallel, the CMA has worked through three local engagement groups called "implementation committees", set up for the Shepparton Irrigation Region, the mid-catchment and upper-catchment regions.

Although catchment management initiatives have a long history in the USA, the picture appears more fragmented. Two partnership forums existed, i.e. the U.S. Inter-Agency Co-ordination team and Cedar River Coalition. They were created following major flooding to encourage voluntary engagement between politicians, governmental and non-governmental organisations, respectively at the level of the Iowa-Cedar catchment and Cedar catchment. In parallel, the State of Iowa and the federal Environment Protection Agency (in part through the Clean Water Act 1972 and the Safe Drinking Water Act, see Benson et al. 2012) have been proactive in promoting catchment management by providing grants for the establishment of Watershed Management Authorities (WMA), i.e. legal entities based on the collaboration of two local or regional political units (e.g. local authorities). Funding is available for the development of catchment management plans when they can contribute to reducing diffuse pollution and alleviate flooding. Implementation depends on the voluntary participation of local actors, which means that usually additional incentives to encourage changes to land management practice are needed.

The case studies above present a wide variety of strategies with linking between levels, from approaches mixing top-down and bottom-up processes (e.g. Australia, France) to approaches that have so far clearly separated processes (e.g. USA and UK, although recent developments in the UK suggest a move towards more integration between WFD implementation and ICM work by river trusts –see sub-section 3.3). While it remains difficult with the material collected to support one approach over another, mixed approaches such as those seen in Australia and France have the advantage of providing an avenue for formalising the results of negotiation between local stakeholders and thereby increasing the level of support from higher levels of governance (see sub-section 3.2).

3.2. How do national and local organisations engage and collaborate with each other?

While institutional structure differed across cases, it was possible to identify in interviews a set of mechanisms used to work collaboratively across scales. These are presented based on an increasing level of commitment by participating actors.

Interviewees first mentioned that lines of communication can be improved by organising regular meetings or employing a liaison officer. The Iowa-Cedar ICM for example mainly works through working groups on issues of interest to participating stakeholders. The main reasons for this non-coercive approach are to appeal to more stakeholders, open up debates, encourage learning, and help reach compromises. It was felt that more formal processes might tempt stakeholders into holding their own agendas. Similar opinions were expressed in other interviews. Interviewees across cases however mentioned that informal approaches rely excessively on voluntary contributions making the process vulnerable to changes in individual agendas, funding opportunities, and changes in personnel. For example, interviewees from ICM projects in England highlighted the difficulty of maintaining interest and commitment by local authorities who have no statutory requirement to be involved in ICM (an exception being the Parrett ICM which presented pro-active but voluntary leadership by the local authority). In contrast, Scottish ICM (Tweed) could rely on the active participation of the local authority, in part thanks to its statutory duties regarding flood risk management.

The second group of mechanisms is time-limited projects. ICM projects in England and Wales were for example mainly collaborating through such projects (some up for more than ten years of successive projects). Advantages in working on a project basis are opportunities to pool resources and leverage funding, resulting in "getting more with less" for individual partners. Disadvantages mentioned mainly include the costs of setting up each collaborative project and the challenge of securing commitment beyond the project end. Interviewees usually mentioned the need for good inter-personal relationships, regular communication, and face-to-face exchange over a long-time helped foster mutual trust and compromise. From interviews across cases, having an independent project manager was seen as an advantage. For example, local projects would be commonly managed by the Rivers Trusts in the UK and by Landcare groups in Australia. In France, the role of "*animateurs*", i.e. technicians appointed to manage the "*contrat de milieu*" and SAGE, was stressed: they must foster participation and integration, somewhat in a similar fashion as the project managers of NGOs in the UK.

The third group of mechanisms targets inter-organisational coordination. Authorities may collaborate to develop common guidance, or even the alignment (in time) of planning and regulatory processes, so as to increase the coherence of policy implementation and reduce implementation burden on local actors. In addition, alignment can help avoid redundancy between organisations and save resources. English environmental authorities interviewed for example used "*Memorandum of Understanding*" to formalise such coordination without making them legally binding. Another example is the "*Framework Agreements*" used by the Adour-Garonne water agency with local authorities to make SDAGEs more operational at local level and move away from relying on ad-hoc opportunities. A yet closer form of collaboration is through the sharing of specific statutory functions. This is used in the Gouldburn-Broken ICM project which promotes service level agreements between authorities for the delivery of land and water interventions at multiple scales. Interviewees nevertheless stressed that inter-organisational coordination is vulnerable to organisational dynamics (e.g. staff movement, resource availability, conflicting policy priorities) and therefore may collapse over time or in crisis situations where statutory duties or core interests are prioritised.

The fourth group of mechanisms is the most formal approach and involves developing joint management plans. In the sample of this research, the majority (11 out 15 ICM projects) had prepared or were preparing a catchment management plan (CMP), although they varied in their level of regulatory impact. The SDAGEs, and the more local SAGEs, in the Adour-Garonne ICM were the most coercive planning mechanisms: other local policies should be compatible with them. In most other cases however, ICM plans had little formal coercive power. For example, another type of used in the Adour-Garonne ICM, the "*territorial action plans*", agreements between municipalities and agricultural stakeholders for reducing diffuse pollution. These helped strengthen the local implementation of SDAGEs objectives but have no regulatory impact on land management practices (beyond minimum European obligations). The risk of having little coercion however was that activities remained largely opportunistic and responded to available funding or local support (usually "hot" topics, for example after a flood). Despite this, it was apparent that some ICM projects with no CMP had a very good track of delivering ICM anyhow. The Parrett and the Tamar ICMs, for example, both engaged extensively with the local community and land managers to deliver water quality improvements and flood risk reduction over the last 15-20 years.

On this basis, interviewees highlighted that the *process* of management planning, rather than the *end-product* (the CMP) was as important, especially in the early years of ICM. They commonly highlighted the importance of first raising awareness of water issues across relevant stakeholders, gathering scientific and local knowledge, fostering collective learning, and encouraging cooperation by identifying synergies between stakeholders and highlighting inter-dependence. When a good working relationship is established, preparing a CMP may then help project partners formalise partnerships through common priorities, improve coordination, and maintaining commitment for investing implementing ICM.

The results above suggest that voluntary and loose forms of collaboration can be beneficial in the early stages of ICM in order to raise interest and encourage the involvement of stakeholders. However, more formalised and coercive approaches can be beneficial at later stages in order to strengthen commitments and effectively implement agreed ICM measures. Nevertheless, arguably, more successful ICM in terms of ambition is associated with the presence of a clear leadership (e.g. river trusts, Landcare group, "*animateurs*") that can drive the engagement and partnership process.

3.3. How do national and local organisations achieve a balance between their respective priorities?

The last theme explored is how national and local priorities were balanced, taking into account the institutional structure and partnership working arrangements described in the previous two sub-sections.

In the Iowa-Cedar river basin, where ICM is not formalised through a strict planning framework, interviewees indicated that the balancing of priorities was driven through negotiations on specific issues between stakeholders. The Inter-Agency Coordination Team, whose central role is to improve collaboration between federal, state and local authorities, sees its role as providing scientific and technical support to local groups willing to engage in ICM. A series of workshops were for example planned in three catchments to trial collaborative planning though scenario-building and visioning methodologies that allows for local engagement to be framed within the broader regulatory, policy and technical requirements. The Cedar Coalition is focused on increasing political and stakeholder awareness, drawing attention to specific issues, and organising meetings for issue-driven working groups. Because of the voluntary nature of the initiative and the broad range of actors involved, consensus must necessarily be reached before projects can be set up. In parallel to these activities,

local authorities may form WMAs to develop catchment plans, but they must necessarily tackle diffuse pollution and flooding to meet respectively federal and state conditions for grant provision. Although this is expected to be led by local actors, there is limited (financial) support for including local priorities in the planning process.

In the UK context, interviewees indicated that ICM activities were mostly aligned towards national statutory commitments, rather than local community interests regarding e.g. amenity improvements, leisure opportunities, or restoration of water bodies of low priority for reaching WFD objectives (in the short term). In particular, most resources were driven and oriented towards the RBMPs which primary purpose is to meet WFD objective. Interviewees indicated that national priorities were nevertheless balanced in several ways, not-the-least by diversifying funding sources. Rivers and Wildlife Trusts complemented resources from national environmental authorities with grants from local authorities, private foundations (e.g. Lottery Fund), interest groups (e.g. WWF), European programmes (e.g. EU Life, Interreg), fundraising, and membership fees. The Westcountry Rivers Trust set up an agreement with the regional water utility to fund a catchment improvement programme in the Tamar catchment. The Frome-Piddle ICM was led by a private water utility which funded changes in agricultural practices to improve water quality. Some NGOs also set up separate businesses. For example, the Ballindery ICM ran an hatchery, while the Tamar and Tyne ICMs provided consultancy services on catchment management.

To support these bottom-up initiatives and further encourage the wider adoption and delivery of ICM, Defra produced in May 2013 a new Catchment Based Approach (CaBa) policy framework (Defra 2013). CaBa aims to embed collaborative working at catchment scale to deliver cross cutting improvements to the water environment, and was brought as a response to criticism from non-state actors on the lack of proper funding and multi-sectoral integration within the WFD implementation process. New community partnerships are now becoming active in each of some 100 WFD catchments, with more than 1500 organisations engaged with CaBa nationwide, including NGOs, water companies, local authorities, landowners, angling clubs, farmer representative bodies, academia and local businesses. There remains though a key role for the Environment Agency in providing data and evidence, enforcing legislation, and linking with WFD RBMP (Defra 2013). In our interviews, participants from both Defra and the EA highlighted risks with CaBa. Many of the local organisations involved are often driven by specific issues (e.g. fisheries) or specific areas (e.g. areas with high cultural or amenity value), which can be to the detriment of promoting a more holistic approach. The long-term

sustainability of CaBa also remains to be proven, since many of these local organisations are financially vulnerable and initial set-up funding support from Defra is planned to cease in 2015.

The Goulburn-Broken catchment was shown to have highly institutionalised ICM processes, although these had to respond to federal, state, and local priorities. In particular, local community engagement had a long and established role in water and land management. Priorities for catchment management materialised with the creation of the CMAs. While relying heavily on federal and state funding, they were provided with some limited power to raise their own resources and have a central role in the Landcare programme. To link the regional with the local levels, the Gouldburn-Broken CMA had historically established facilitators to influence Landcare groups but also to integrate their priorities in the catchment's strategy. In addition, "*implementation committees*" were set up, although they essentially separated downstream from upstream actors, and, as their name suggest, were recipient of policies and funding rather than influencing their design. The CMA is now adopting a new community engagement model which aims to increase local actor influence on annual state funding review cycles, and move towards a common perception of a shared catchment amongst local actors. The new "*community advisory groups*", replacing the "*implementation committees*", have a greater role in articulating local priorities in order to better influence the setting of CMA and state objectives.

In France, where ICM processes are also highly institutionalised, SDAGEs and SAGEs must respond to river basin (regional) and catchment (local) priorities, while considering also statutory requirements set at national and European levels. However, SDAGEs have been identified as the main planning mechanism for implementing the WFD. While their scope remains broad (and should respond to regional priorities), interviewees indicated that they are increasingly oriented towards meeting WFD objectives. In contrast, while SAGEs are expected to support a minima the reaching of WFD objectives, they are mainly led by local actors in particular local authorities. However, the interviewee noted that, in reality, local actors may find it difficult to fund locally-relevant measures that are not associated with broader statutory requirements as most funding comes from national and regional authorities. In addition, it appears that the water agency is now using a different type of agreement, "*catchment contract*s", to promote measures for WFD improvements. This contract allows for a negotiated agreement between the water agency, an organisation willing to take forward catchment management, and other financial partners, without the extensive consultation and planning required by SAGEs. In both cases (SAGES, catchment contracts), the role of the local "*animateurs*" was highlighted as having a

crucial role in balancing priorities and help find a compromise between participating actors (see also Richard-Ferroudji 2008).

Overall, the evidence presented above shows that achieving a balance between national and local priorities is a struggle within any institutional or collaborative set-up. Results indicate again the importance of leadership by key actors (see sub-section 3.2), as they invest time and effort in bringing parties together to find compromises. However, results also suggest that leadership alone is not a recipe for successful ICM, and that a supporting institutional and policy framework needs to be in place in order to increase the legitimacy of ICM processes and adequately direct (public) funds to achieve ICM objectives.

4. Linking formal "top-down" policy processes with voluntary, "bottom-up" catchment scale initiatives: an illustration from Scotland

This section complements the presentation of the results of the survey with an illustrative example taken from the surveyed ICM. The Scottish case-study was selected as many of the above observations can be seen to have been at play in the development, over some 25 years, of ICM in the Tweed river basin and in the activities of the Tweed Forum, a local charity promoting integrated water and land management across some 5,000 sq kms of the English:Scottish borderlands..

Originally formed by local actors as a 'talking shop' to bring together stakeholders with a common interest in water management along the river Tweed, the Tweed Forum focussed its early work on local issues of immediate concern to local community interests. Like many current small scale NGOs in the UK, it did not look to influence issues beyond the river channel, outside the Tweed catchment, or to address strategic priorities. This stage of their development occurred at a time when 'top-down' influences were minimal (pre-dating WFD). The organisation was at this stage not staffed and relied entirely on the goodwill of its loose body of constituent members, drawn from local organisations north and south of the Scottish : English border (Spray and Comins 2011). In these respects, it mirrors many of the early UK river partnerships, prior to the emergence in England and Wales of CaBa.

The first moves towards both a larger scale of operation and a broadening of focus to include issues beyond the river channel were precipitated by the opportunity to apply for significant funding from the UK National Heritage Lottery Fund. This necessitated formalisation of the loose group of members as a limited company, and the employ of permanent staff to facilitate the delivery of a catchment wide set of projects. These were co-created with local communities covering four themes – education and interpretation; the built and cultural heritage; access and recreation; and the natural heritage. The output was the delivery, in two phases, of a £9 million series of projects to improve the Tweed. This in itself did not lead to better alignment or linking scales of local and national governance; rather it established Tweed Forum as a regional player with a track record of delivery across a wide range of issues of direct priority to local groups. It did though subsequently lead to the creation of the first Tweed Catchment Management Plan, a bottom-up development that pre-dated WFD river basin management planning, created through this engagement with stakeholders across the Tweed. Most importantly though, it built reputation and trust in Tweed Forum from both local communities and from regional government. Other UK partnerships, such as the Ballinderry (covered in the international survey) have similarly benefited from large scale external funding to deliver a series of projects, in this case focussing on recovery of Freshwater Pearl mussels, but taking a catchment approach with extensive engagement with all the farmers in the catchment to address land management issues impacting on water quality.

This local scale expertise was subsequently recognised by the Scottish Environment Protection Agency (SEPA) when it came to set up Area Advisory Groups (AAG) for the process of engaging stakeholders in WFD river basin management planning in 2009. Across the UK, new groups were specifically created for the purpose, but in the Tweed, it was recognised that this already existed and effective stakeholder engagement was an established element of Tweed Forum's working. As a consequence, Tweed Forum became the de facto AAG. This situation begins to mirror that seen in the Gouldburn-Broken ICM project where catchment partnership became gradually formalised based on prior strong collaborative, community-based initiatives. In the Tweed though, the catchment partnership was already closely engaging actors from multiple levels at catchment level. Elsewhere in the UK, where long-standing collaboration may not exist, a more standard planning (but non statutory) framework, such as the one seen with SAGEs in the Adour-Garonne ICM project, may be more effective in initiating the collaborative process.

These activities, and subsequent engagement for EU Flood risk management planning, brought Tweed Forum more to the eye of national government, and was subsequently involved in a series of projects on nationally important topics – including climate change adaptation for farmers (Cheviot Futures 2015); control of invasive species, such as Giant Hogweed; education outreach on river catchments; and experimental restoration for natural flood risk management and WFD status recovery in the Eddleston and Ale sub-catchments (Rouillard et al 2014; Tweed Forum 2015). Tweed Forum now found itself being invited on to national policy steering groups in areas such as flood risk management and rural development, and being asked to showcase its work through stakeholder workshops, and visits from practitioners and policy-makers. The enhanced interaction not only enables Tweed Forum's influence and local expertise to be utilised, but it also exposes Tweed Forum to national priorities for catchment management in a very direct manner providing a chance to align processes across space and time at least informally in the planning stages of project and programme development.

The question of how to achieve a successful balance between delivery of top-down priorities and bottom-up aspirations however provides a constant tension. At the same time as participating in delivery of WFD programmes, Tweed Forum has needed to continue to deliver on projects of local concern, including those unrelated to national priorities, such as the restoration of Fatlips castle, an historical site of local importance. It has also occasionally decided not to go for or not to accept work or projects where to do so would have threatened its local reputation and independence. Issues such as wind farm payments or certain planning applications have been areas where the organisation remained neutral, irrespective of national policy.

Most recently, Tweed Forum has taken a central role in one of the two national pilot studies of the Scottish Land Use Strategy, using an Ecosystems Approach. This may represent a novel way to align local issues on ecosystem services with national policy priorities (Spray et al. 2014). The pilot included a series of catchment meetings that begin to follow the Iowa-Cedar creek ICM, where a series of workshops were undertaken in three catchments to trial collaborative planning though visioning methodologies that allows for local engagement to be framed within the broader regulatory, policy and technical requirements. Whether the approach taken in Scotland will eventually lead to a more formal approach being adopted remains to be seen.

Having started as a bottom-up initiative, it has integrated (top-down) WFD targets and processes while maintaining its strong stakeholder and community focus. The Tweed Forum's gradual development as an

intermediary between state and society, bridging local and national scales of governance has been a hall-mark of their success, expressed in terms of project delivery, continuing financial success in winning grants, and, more recently in terms of their growing influence on government and agency strategy around catchment management, rural land use and climate change adaptation. Tweed Forum is now recognised as an exemplar in integrated participative catchment management across UNESCO HELP Basins and in the UK, winning the new UK Rivers Prize 2015, rewarding the best in river restoration and catchment management, as well as the individual category for partnership working. A key learning point in the development of Tweed Forum as an effective participative catchment organisation aligning work across scales is this role as a "*trusted intermediary*". Too close an alignment with national government risks Tweed Forum as being seen as an "*agent*" of governmental policy, untrusted by local land managers; too close an alignment with local environmental issues risks it being seen as a pressure group or local campaigning voice – untrusted by national government. Occupying that middle ground, but shifting slightly at times in response to sometimes conflicting pressures from 'top' or 'bottom' can be seen to be as key for Tweed Forum as it is for the other UK, French, Australian, and US examples described.

5. Working across scales: the role of trusted intermediaries, multiple engagement processes and a supporting policy framework?

What can we learn from the above results for adaptive water governance? First, organisations and individuals that act as "*trusted intermediaries*" can successfully close the gap across levels of governance, i.e. between communities, business, and governmental interests at multiple scales. In particular, more local trusted intermediaries perform well, with their local knowledge, at building rapport with key actors and effectuate change on the ground. In the UK, the strong top-down approach taken by authorities (i.e. through WFD RBMP) is balanced by very active trusts, with strong roots in the communities and environments in which they operate. In the sample surveyed during this research, they appeared to have significant roles in ICM (i.e. the "*researching*", "*campaigning*" and "*delivering*"), and indeed shared the three main principles identified by Cook et al. (2013): trust brokers (to overcome conflict and disagreement), collaborative decision-making (to deal with problems), and win-wins (to foster lasting mutual benefits). Trusted intermediaries took the shape of "*animateurs*" the Adour-Garonne ICM project and Landcare groups in the Gouldburn-Broken ICM project. These individuals and organisations resemble the change "entrepreneurs" the adaptive water governance literature which push for reform agenda and adaptation of practices (Huitema and Meijerink 2010).

In some cases, a local elected body such as the local authority in the Parrett, may take the role of "trusted intermediary". While this does not appear to be a requirement for success, strong involvement of democratically elected bodies appears beneficial in terms of raising the legitimacy and funding security of ICM projects. In the Tweed ICM, the involvement of the local authority (thanks, amongst others, to its legal responsibilities regarding flood risk management) was seen as a key strength while poor engagement in other English ICMs was seen as a weakness. France and Australia have also set up ICM structures that strongly involve elected bodies. In France for example, local authorities usually preside the "*local water commission*" of the SAGEs. Our results indicate that involvement of democratically elected bodies cannot rely solely on voluntary participation, but requires a mechanism such as funded duties and responsibilities to enable them to be fully engaged.

Second, findings suggest that there is a need for a legal framework, or at least an established policy structure, that acts to harness the good will and interests of local actors while improving implementation of broader, national objectives. France (i.e. SAGEs, SDAGEs) and Australia (i.e. Landcare, community engagement model of CMAs) are the most telling examples that opted for establishing a policy framework that supports locally-led ICM. It is also remarkable that England has also recently established a national policy framework (i.e. CaBa) to better integrated locally-led ICM and WFD implementation (see also Watson, 2015).

There appears to be no particular best specific mechanism for multi-level collaboration (agreeing in that sense with Allen et al. 2011 observations for New-Zealand); rather, multiple processes, both voluntary and statutory-based, helped to engage local, regional and national actors at different spatial scales. Enhanced and focussed communication across levels is crucial to create an understanding of where different priorities lie and, can potentially overlap. Promoting collective learning (Ison et al. 2007) and the search for compromise has long been recognised, in particular because they help participants to recognise inter-dependence and build adaptive co-management (Huitema et al. 2009). Several "forms" of collaboration were described from the surveyed ICM projects: informal exchange, collaborative projects, inter-organisational coordination, and strategic planning. Their use depends on the existing level of trust, commitment, time, and resources. It is essential though that they are not seen as a way to deliver solely one (dominant) party's aims and objectives (i.e. meetings, agendas and resources organised around just one party's timetable and targets). This means recognition that others' targets

and desires need to be addressed, even where tangential (or less connected) to the roles and remit of a dominant partner.

Our results suggest that the level or scale at which catchment management is to be carried out is an important factor for achieving multi-level collaboration *that result in effective implementation*. In France, strategic planning at the level of SDAGE and SAGE was complemented by individual projects and agreements (e.g. *catchment contracts*) at smaller scales in order to reach to individual or small groups of actors. In Australia, the CMA is structuring smaller sub-catchment so called *implementation* groups. In the US, ICM is effectively achieved via pilots at catchment level. The example of the Tweed Forum is telling in that success in ICM implementation was associated with engagement at local level, e.g. sub-catchment level initiatives (e.g. Eddleston -69km^2, Ale -180km^2) and directly with individual villages, community groups, and land managers. In doing so, the local population could see the immediate relevance to their interests of a catchment management. This nevertheless requires large upfront investment and time to build rapport and maintain two-way communication, and thus constraint catchment management in the short-term. Trust and commitment may be greater in the long-term.

While a supporting policy framework is an important ingredient for linking national and local actors, funding arrangements has a major role in securing commitment and equal treatment of priorities. Most ICM projects depended on a wide variety of sources and few were financially sustainable, with the risk of skewing processes towards activities supported by the more resourceful actors. In particular, most "trusted intermediaries", in particular the river trusts in the UK and the Landcare groups in Australia, had limited financial capacity to maintain a level of independence from individual funders in particular national (environmental) agencies (see also e.g. Barwick 2008; Lockwood et al. 2009 for a review of Landcare groups in Australia). Careful attention is to be given to financial arrangements for ICM activities in order to maintain a balance between thematic issues of importance to different stakeholders during implementation. Further research is warranted to understand how different types of financial mechanisms can best support ICM and adaptive water governance.

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